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a mathematical relationship. The sixty-four problems taken up range from the process of counting up to ten, through the four fundamental operations, fractions, the elementary geometric forms, to various progressions, permutations, the conic sections and their equations, and magic squares. They do not form any connected theory, but still are arranged in well-ordered sequence.

The work is not intended for pupils, but for teachers, and is replete with pedagogic suggestions, the fruit of the writer's many years of experience and thought on these lines. American teachers, both in grades and high schools, may well draw on this little book for material to lead up to development of occasional topics.

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Algebra for Secondary Schools. By WEBSTER WELLS. Boston: D. C. Heath & Co., 1906. Pp. x+462.

This book includes chapters on progressions, application of undetermined coefficients to expansion of fractions, separation into partial fractions and reversion of series, logarithms, permutations and combinations, and a few pages on exponential and logarithmic series. The various topics are taken up in the usual order and the treatment is in the main that of the general run of textbooks. On pp. 3-7 are several "examples to illustrate the use of algebraic symbols in the solution of problems." Formal work is then taken up and no problem is introduced until p. 57 is reached. It is a satisfaction to note that the reasoning in the earlier portion of the book is less abstract, such discussions being postponed until a later stage of study. Such topics as H. C. F. by the division method, binomial theorem for positive integral exponents, the fundamental laws, remainder theorem, symmetry, equivalent equations, synthetic division, indeterminate forms, are placed at the close of the book. An excellent index adds greatly to the usefulness of the work.

Evidently the cry of the teachers of physics has been heard, and an attempt made to still it if not to satisfy it. A few physical problems and formulæ have been added here and there, but they seem more like patches than a part of the woven cloth. Among the formal exercises in transformations, other letters than x , y , a , and b are frequently used. But when it comes to the study of the equation, the $x-y$ method is almost constantly used. The equation as used in geometry is not even hinted at.

In compliance with a growing demand, the graph has been introduced, but always at the close rather than at the beginning of a discussion of equations of two or more variables (the author uses the time-honored term "unknown"). If the graph is to be of service in straightening out the intricacies of simultaneous equations, it should come as a rising sun to throw light upon them rather than as an afterglow in sweet memory. Unless the graph can be made an integral part of the subject, and it has been abundantly proven that it can, it had better be left out.

It is necessary to call attention to certain looseness in definitions that mars the book. The L. C. M. is defined as "the common multiple of lowest degree," and it is said that if there are numerical factors the least should be taken; thus, $4x-2$ is made the L. C. M. of $4x-2$ and $6x-3$, which does not agree with the use of the L. C. M. in the reduction of fractions to their lowest common denominator. We are told that "to factor an expression is to find two or more expressions which, when multiplied

together, shall produce the given expression." This is not in accord with the facts, as is shown by the very illustration used by the author:

$$5a(x-y) - 3a(x+y) = 2a(x-4y)$$

We find such curious terms as "fractional linear equation," "fractional quadratic equation." How an equation can at the same time be linear and fractional is, indeed, a poser! That same half-truth which is forever turning up is given further currency: "If the same expression be added to both members of an equation the resulting equation will be equivalent to the first." How about

$$x = 3.$$

$$x^2 + x = 3 + x^2 \quad ?$$

Of what use is it to prove the theorem: "A quadratic equation cannot have more than two different roots." Any bright boy will say at once "May it not have any number of equal roots?" The emphasis placed on the word different implies that there may be.

The manner in which a subject is presented is often a matter of taste. The author treats variation from the viewpoint of proportion, rather than that of functionality, which is rapidly growing in favor with mathematicians and physicists alike. He retains the almost obsolete symbol ∞ . It would seem better to write $y = mx$ at once. It is to be regretted that the author has made so little use of the idea of functionality. The treatment of inequalities would be more satisfactory if the solution of the important type $\frac{n-3}{n-2} > n-1$ were considered.

It may be said in general that the book is built on the older and more conservative lines. It contains a large number of new and interesting exercises. The treatment is direct and within the capacity of the secondary student. It does not, however, satisfactorily meet the demands of many teachers of mathematics who are striving toward a more living presentation of the subject.

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Aus deutschen Lesebüchern, Epische, lyrische und dramatische Dichtungen, erläutert für die Oberklassen der höheren Schulen und für des deutsche Haus.
Band IV, Abteilung I: Epische Dichtungen. By O. FRICK UND FR. POLACK.
4. Auflage. Leipzig und Berlin: Th. Hofmann, 1906.

Every teacher of German should know three large publications which appear at present and rank foremost among pedagogic works on German literature. They are: Johannes Meyer, 1. *Aus der deutschen Literatur*; 2. *Einführung in die deutsche Literatur* (Berlin: Gerdes und Hodel), *Handbuch des deutschen Unterrichts an höheren Schulen*, herausgegeben von Adolf Matthias (München: O. Beck), and the publication under whose title this review is written.

Meyer's *Aus der deutschen Literatur und in die deutsche Literatur* contains numerous selections from all periods of German literature, and appears in single booklets, costing 1 M. each. Thirty-six numbers have already been published and there will be about eighty altogether. Matthias' *Handbuch* will comprise, when finished, fourteen volumes, three of which are out by this time.

Larger than the above mentioned publications is the collection called *Aus deutschen Lesebüchern*. It contains a thorough commentary to all the German literary